

Adopt a Stream

STORM DRAIN MAPPING PROJECT FIELD MANUAL

January, 2002

Riverways Programs
Department of Fisheries, Wildlife and Environmental Law Enforcement

Introduction:

This Storm Drain Mapping Project Field Manual is designed to aid Stream Teams and other volunteer groups in identifying storm drain outlets in their communities and in assessing problems with the stormwater system. While point sources of pollution to rivers and streams have been minimized due to improved wastewater treatment, and through Clean Water Act permits, non-point source pollution continues to cause problems in our waterways. This non-point source pollution includes substances from roadways, parking lots, construction areas and lawns. The main conduit for these substances to get to our waterways is through stormwater and the municipal storm drain system. The Environmental Protection Agency is now treating these discharges as point sources and is requiring permits to be written for municipal stormwater systems in urbanized areas with populations under 100,000 and for construction sites of one acre or more. Urbanized areas are being determined by the Department of Environmental Protection and the EPA. The goal of this permitting is to reduce the amount of pollution contained in our community's stormwater.

The Environmental Protection Agency's National Pollutant Discharge Elimination System (NPDES), set up by the Clean Water Act, has generated significant gains in pollution control. Through this program, point sources of pollution (wastewater treatment plants, industrial dischargers) are given permits for their wastewater. The EPA has now focused its attention on stormwater, since it carries with it pollution from various upstream landuses. As the EPA begins to focus on its NPDES Phase II storm water regulations, many Massachusetts cities and towns will be faced with obtaining NPDES permits for their stormwater discharges. This permitting is new to Massachusetts (except for Worcester and Boston) and many cities and towns do not have the necessary information or knowledge of their stormwater systems to make headway in reducing nonpoint source pollution and for satisfying the requirements of a NPDES Phase II permit.

Prospects for re-opening of shellfish beds and for cleaner rivers and streams have prompted groups to make an effort to help towns and cities map and examine their storm drain systems. This project expands the Pipe Survey section of our shoreline survey data sheets for conducting surveys of storm drain outfalls along streams and rivers. This Stream Team project will help provide communities with the information needed to make responsible decisions regarding runoff from roads and maintenance of their stormwater systems. This project will also help communities gather information needed to complete stormwater management plans as required in NPDES Phase II permits by 2003. As a result of these projects, we hope that towns and cities will make a renewed effort to pursue various management options and best management practices (i.e. more intensive street sweeping and catch basin cleaning, storm drain stenciling, stricter enforcement of litter and domestic pet ordinances, etc.), including treatment of the "first flush" of rainfall events.

The worksheets in this guide are designed to help you locate and record information on storm drain outlets within your watershed. The information you will collect can be entered into a community's Geographic Information System (GIS) database or can be used to update their storm drain maps. Specifically, you will be gathering information on the location and condition of storm drain outfalls and catchbasins and whether there are concerns (sediment, dry weather flow, odor) with any of the outfall pipes.

Working with the Phase II Program

EPA will require your community's Phase II stormwater management program to include six elements that when implemented together will result in reductions of pollutants discharged to the river or waterbody. These six program elements are called "minimum control measures" and are:

- Public Education and Outreach
- Public Participation/Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Runoff Control
- Post-Construction Runoff Control
- Pollution Prevention/Good Housekeeping

Your storm drain mapping project will satisfy some requirements for *Illicit Discharge Detection and Elimination* and *Public Participation/Involvement*. Any Stream Team work dealing with educating the public about stormwater issues will begin to satisfy requirements under *Public Education and Outreach*. Phase II fact sheets are included with this guide for you to use and share with your town. A complete set of fact sheets can be found on the web at: <http://www.epa.gov/owm/sw/phase2/factshts.htm>

Field Work:

I. Working with the Town:

As part of the *Illicit Discharge Detection and Elimination* minimum control measure, a town must develop a storm drain system map showing the location of all outfalls and the names and location of all waterbodies receiving those discharges. This map is needed to help determine dry weather flows (possibly indicating illicit discharges), and their possible sources. Sources of illicit discharges may include illegal sewer hookups into the storm drain system, septic tanks, car wash or laundry wastewater, improper disposal of oil or other household or auto fluids, or spills from roadway accidents.

The first step in your investigations will be to talk with the Department of Public Works or Sewer Commission about their knowledge of the storm drain system and whether or not they are developing a stormwater program. Attached are fact sheets about the EPA Phase II process. Let them know that this project can count towards their requirements for detecting illicit discharges and involving the public in the development of their stormwater program. You will also want to meet with the Planning Office and Health Department to get their input on the extent of your survey and to find out how to make the information you collect useful for them. We recommend that you put together a steering committee of town officials and Stream Team members to guide your work.

II. Field Surveys:

Get copies of all maps or drawings available of the storm drain system and the locations of outfall pipes. Determine your study area by talking to town officials. Collectively determine where your work can have the most impact while considering the safety of volunteers. Depending on your time, the number of volunteers, and the size of the storm drain system, you may not be able to cover pipes on all rivers and tributaries. Remember, you are volunteers and whatever you can get done will help the community and its river. Number the outfall pipes you will survey on the municipal maps so the numbers can be used during fieldwork. If no maps exist, you will need to review city records and interview DPW staff to determine information on the storm water system and conduct the survey by locating existing outfalls.

Fieldwork will involve surveying banks of the river or tributaries by walking the shoreline or using a boat. Before beginning work, send letters to river abutters in the survey area announcing the project and inviting them to join the survey. (A sample letter from the Shawsheen River Watershed is attached).

- If you have a municipal stormdrain map, begin by locating the outlets marked on the map. You may want to have a street map handy for navigating. Use a base-map (topo map or orthophoto) to mark locations of outfall pipes as you survey them using the numbers you established on the city maps. Fill out the survey form for each pipe as you survey it.
- If you discover a pipe that is not marked on the city stormdrain map, note it on the base-map with an "X1, X2, etc." using a different colored pen or pencil. If you are not sure if a pipe is part of the stormdrain system, look for associated catch basins on the road and look into them with a flashlight to determine the direction of flow.
- Also, if you can't find a pipe shown on the city maps, look into nearby catchbasins to see what direction the pipe inside (if any) is facing. Catchbasins are generally covered by a grate to let in surface water flow and have a sump (a well for catching sediment and debris) below. When water fills up the catchbasin, it flows "downstream" through a pipe/outlet at the top. Catchbasins are

generally strung together by a pipe system that eventually outlets at a river or other body of water. Do not worry if you cannot find an outlet. It could be buried or submerged underwater. Some outlets may also be mapped on old town drainage maps, yet were never constructed.

- Some areas may have paved swales coming from the street instead of catchbasins and pipes, especially at bridge crossings or culverts. Survey these as well because they are conduits for stormwater entering the stream from the roadway. Also survey eroded channels or gullies that are acting like unpaved swales, since they are evidence of erosion and a conduit for stormwater.

III. Filling out the Survey Sheets:

- Record the number or letter of the outlet or swale on the base map and survey sheet as you survey it. The material of a pipe can usually be described as concrete, corrugated metal or metal. Note if the pipe is crumbling or if it is in good, fair or poor condition. Note swales as paved (asphalt), concrete, stone or other material or if they are unpaved swales.
- Measure the diameter of swales as the distance between the upper edges, and measure pipes through their widest section. Try not to touch the flow. Note if there is a headwall at the outlet (a cement wall around the pipe) or large rocks (rip-rap) at the outlet.
- Note the slope of the bank under the pipe outlet or swale and whether or not scouring has occurred. Measure the distance from the pipe to the stream channel or from the end of the paved section of swale to the stream channel. Note if pipe is partially or totally submerged.
 - ⇒ If the pipe has been flowing at a high rate, the force of the water may scour the bank or sediment just below the pipe. A steep slope will increase this threat, as will the distance of the pipe from the channel.
 - ⇒ If the outlet from a swale allows flow to spread over vegetated ground without scouring instead of flowing directly into the river, this is good and will slow the water and reduce some of the flow.
- Indicate flow on the survey sheet by drawing the depth of water in the pipe and describe it as heavy, moderate, slight, trickling or wet. Note the color and odor of water and if there is sediment (usually road sand) accumulated at the outlet or on the stream channel bottom or if algae is present.
 - ⇒ For example, a 24-inch pipe with a one-inch deep moderate flow contributes about 15 gallons/minute.
- Be as specific as possible when describing location and access to the outlet. Record road names and intersections whenever possible. If there are several pipes in an area or if they are hard to find, draw a location sketch including road names and street addresses if available or other clues. (Riverways has Global Positioning System units for your group to borrow if you decide to include this data. Talk with the town about whether latitude/longitude coordinates from GPS will be useful. There are separate data sheets for the GPS units. Taking GPS data will increase the time needed for the surveys).
 - ⇒ This information will help town officials when they need to map the pipes, or if they need to recheck problem pipes.

- Estimate the percent of impervious cover immediately upland of the outlet. Look at land use around you. Is it a residential area? A mall? Conservation land or a mowed park? Impervious surfaces are hard surfaces that do not allow infiltration of water. More hard surfaces (roofs, driveways, parking lots) contained in an area will bring a larger, faster flow that contains more pollutants. See attached material for notes on the pollutant composition of stormwater. This information will help to assess the amount of contaminants and impacts each outlet could have on the receiving waters.

Land Use	% Impervious Cover
Shopping Center	95-100
Commercial	85-95
Industrial	75-85
Residential, High Density (< 1/4 acre zoning)	35-65
Residential, Med. Density (1/4 to 1 acre zoning)	20-35
Residential, Low Density (>1 acre zoning)	10-20
Open Areas	0-10

- Rating system: Information on potential problems at outlets will be important for the town when completing their stormwater plans. Use a 0-2 rating system to indicate problem areas for the town to follow up on. Take photographs of areas that have potential problems.

0: No observed impairment

- ⇒ no dry weather flow
- ⇒ no observed sediment deposition or erosion at or near discharge area
- ⇒ no observed solids, floatables, or debris related to outlet \
- ⇒ pipe in good repair

1: Potential impairment – needs rechecking

- ⇒ dry weather flow, some odor
- ⇒ moderate sediment deposition or scouring near outlet
- ⇒ moderate floatables, solids, trash/debris or algae at or near the outlet
- ⇒ pipe in poor condition

2: Impairment – needs investigation

- ⇒ dry or wet weather flow exhibiting wastewater odors, colors, solids, floatables, or turbidity
- ⇒ dry or wet weather flows exhibiting oily sheen
- ⇒ considerable sediment deposition, scouring, trash/debris or algae growth at or near the outlet
- ⇒ pipe collapsing or crumbling
- ⇒ contributing drains or catchbasins blocked by debris or sediment

Tips for Surveying

Safety and Legalities

- ◆ Always walk with someone.
- ◆ Watch out for irate dogs. Walk cautiously and practice good dog etiquette.
- ◆ Do not drink the river water.
- ◆ Lifejackets are required by law for each person in the canoe.
- ◆ From September 15 to May 15 all canoe or kayak occupants must wear a U.S. Coast Guard Approved Personal Flotation Device.
- ◆ Wear long-sleeved shirts and pants to protect against, ticks, mosquitoes, poison ivy and nettles.
- ◆ Do a post-survey tick check
- ◆ Wear insect repellent if necessary.
- ◆ Consider landowner rights. Ask permission to cross private land, posted or not.
- ◆ Do not enter posted areas without permission. Take advantage of any public access points.

Environment:

- ◆ Don't walk on unstable banks; your footsteps could speed erosion and put your safety at risk.
- ◆ Be aware of wildlife and animal homes, for both of your sakes.

NEVER PUT YOURSELF IN DANGER TO GATHER SURVEY INFORMATION.

If at anytime you feel uncomfortable about the stream conditions or surroundings, please STOP your Survey.

Checklist: What to take on your Survey

- ___ A buddy
- ___ Storm Drain Mapping Manual
- ___ Survey Sheets
- ___ Extra paper for notes
- ___ Street maps, town storm drain maps, base map (Topo or orthophoto)
- ___ Clipboard or other surface for writing
- ___ Two pencils – color is good to mark on maps
- ___ Long-sleeved, snag-free clothing /pants (for bugs and thorns)
- ___ Sunblock
- ___ Sunglasses (polarized to see into the water better)
- ___ Lifejackets & paddles if canoeing
- ___ Camera and film
- ___ Gloves
- ___ Copy of letter sent out to landowners
- ___ Measuring tape
- ___ Flashlight
- ___ Water for drinking

Optional:

- ___ Rubber boots or waders
- ___ Rubber gloves
- ___ Compass
- ___ Field guides (in ziplock bags)
- ___ Food, for energy

References:

Kimball, J., and Maria VanDusen., *Adopt-A-Stream Shoreline Survey Leaders' Manual*, May 1996

Massachusetts Department of Environmental Management, *Stormwater Management, Volume Two: Stormwater Technical Handbook*, March 1997

Strauss, J., and Curt Laffin: *Shawsheen River Watershed Storm Drain Outlet Mapping Project*, April, 2000

USEPA, *Phase II Fact Sheets*. EPA 833-F-00-001 – 007, January 2000

SAMPLE LETTER TO ABUTTERS

Shawsheen River Watershed
Letter to Neighbors

February 2000

Dear Neighbor,

The Merrimack River Watershed Council (MRWC), in Lawrence, MA, is in the process of mapping storm drain outlets of the Shawsheen River by walking or canoeing the entire mainstem, floodplain, and tributaries of the river. We hope you will participate in that effort and especially provide us with your ideas, concerns, and help in determining the location of storm drain systems, and in protecting your interests as abutters. We are already talking with each town about their input and knowledge of storm drain systems.

Because you are a neighbor of the Shawsheen River, this letter is to inform you of the project MRWC will be involved in until September 2000. A press release has already been published in local newspapers informing all town residents of this research, yet we would like to personally inform you, as you are directly affected by our field work.

MRWC is a 22 year old river conservation organization with a history of protection of the Merrimack River and its watershed. Our headquarters are located in Lawrence, and we cover the drainage basin of the Merrimack and its tributary streams in New Hampshire and Massachusetts.

Please feel free to contact Jessica Strauss in our Lawrence office at (978) 681-5777 extension 15. She will answer any questions and note your comments for consideration in our study. We will contact you in the future to invite you to join us for our Storm Drain Outlet/ Flow Study Conference to be held this summer.

Sincerely,

Ralph H. Goodno
President
MRWC